AMENDMENTS TO THE SPECIFICATION

In the Non-Final Office Action, Examiner Choi objected to the specification. The Applicant is concurrently filing a responsive substitute specification in accordance with 37 CFR §1.125. No new matter was introduced into the substitute specification. Withdrawal of the objection to the specification is respectfully requested.

#9 |Sub Spec

~~Luminaire~~

LUMINAIRE

FIELD OF THE INVENTION

The invention relates to a luminaire for illuminating an object.

The invention further relates to an assembly of a first luminaire and a second luminaire.

The invention further relates to a method of presenting and/or selling an object.

BACKGROUND OF THE INVENTION

Such a luminaire and such an assembly are known per se. They are used inter alia in ceiling lighting for illuminating objects such as, for example, in a shop window, in a shop, in an exhibition space, for example for illuminating artistic objects, or in a showroom, for example for illuminating comparatively large objects, for example motor vehicles. Such an assembly or luminaire is also used for wall illumination so as to illuminate objects sideways, or for floor illumination, for example on stages, for illuminating objects or persons. Furthermore, ~~said~~ the assembly and luminaire are used as backlights for, for example, (picture) display devices such as, for example, (PA)LC displays or video walls, and as office lighting or as a luminaire for enhancing the visual appearance of an object. Usually, an assembly as mentioned above comprises a plurality of luminaires mounted next to one another, often in the form of a number of coupled squares.

A luminaire of the type mentioned above has a major drawback. The luminaire has a surface with a non-homogeneous light distribution. As a result of this, the object is not evenly illuminated, which is undesirable.

SUMMARY OF THE INVENTION

The invention has for its object to counteract the above drawback.

According to the invention, this object is achieved by ~~means of~~ a luminaire for illuminating an object, wherein the luminaire comprises a housing for accommodating at least one tubular lamp, which housing has a light emission window for illuminating the object and a side wall transverse to the light emission window, a diffuser being positioned in the light emission window, and wherein a curtain is provided between ~~said~~ the tubular lamp and the diffuser at a distance from ~~said~~ the diffuser for obtaining a homogeneous light distribution in at least two stages, with the result that the light emission window shows an evenly illuminated surface.

It was found that the light emission window shows an evenly illuminated surface during operation of the lamp. The expression "evenly illuminated" in the description of the present invention means that the light emission window during operation has a light distribution over the surface of the light emission window which shows differences in intensity which are not or substantially not observable to the human eye. In other words, the light output of a light emission window has a dependence on the position on the light emission window which is not or substantially not observable.

Light emitted by the tubular lamps during operation reaches the light emission window of the luminaire and is emitted there in the direction of the object. Such a luminaire usually comprises a plurality of tubular lamps, for example low-pressure mercury vapor discharge lamps. These light sources are usually distributed in a certain regular arrangement in the housing, such that the tubular lamps are positioned, for example, parallel to one another.

The inventors have recognized that a light homogenization in two stages contributes to a very homogeneous distribution of the intensity of the light issuing from the light emission window, rendering the contours of the tubular lamps at least substantially invisible to an observer. The curtain divides an internal space in the luminaire into a first and a second chamber. A first homogenization of light is achieved in the first chamber and during the passage of the light through the curtain. Preferably,

the curtain has a light transmission variation by ~~means of~~ which a yet further homogenization of the light issuing from the light emission window can be achieved, the transmittance to light of the curtain being chosen to be smaller directly opposite a location where ~~said~~ the tubular lamp is present during operation than farther removed from the lamp. The curtain may be, for example, a woven gauze with a variation in its mesh width, the mesh width being chosen to be comparatively small directly opposite the location where the tubular lamp is present during operation as compared with locations farther removed from the lamp. Preferably, however, the curtain is a layer having a variation in its layer thickness, which can usually be provided in a comparatively simple and inexpensive manner. The layer thickness of the curtain is chosen to be greater directly opposite the location where the tubular lamp is present during operation than farther removed from the lamp. A curtain which is comparatively thick in locations on the light emission window closely adjacent the tubular lamp and comparatively thin in locations on the light emission window comparatively farther removed from the tubular lamp or lamps achieves a comparatively high uniformity of the distribution of the light intensity of the light issuing through the curtain from the first chamber during operation. The light coming from the first chamber enters the second chamber, where subsequently the light is further homogenized owing to reflection of the light in the second chamber and owing to the passage of the light through the diffuser, before the light is emitted through the light emission window. The homogenization of light in two stages owing to, inter alia, the curtain and the diffuser provided in the light emission window renders it possible to position the tubular lamps close to the curtain and accordingly to the light emission window, with the result that the dimensions of the luminaire are more compact than those of the known luminaire, while nevertheless a more even light distribution is realized than with the known luminaire. This renders it possible to reduce the depth of the housing substantially, which is a major advantage in mounting the assembly.

Preferably, the transmittance of the curtain where the layer thickness is greatest amounts to approximately 50% of the transmittance of the curtain where the layer thickness is smallest. In other words, the transmittance of the curtain on the light emission window directly opposite the location where the tubular lamp is present during operation amounts to approximately 50% of the transmittance of the curtain at the area of the light emission window where the tubular lamp is at a maximum distance from the light emission window during operation. Particularly suitable materials for the curtain are reflecting and/or light-scattering materials such as calcium halophosphate and/or calcium pyrophosphate. Such a curtain is preferably provided in the form of a paint to which a binder, for example a fluoro-copolymer enabling the omission of an otherwise necessarily separate baking out step of the curtain, is added on a carrier, for example a carrier manufactured from transparent glass, synthetic resin, or perspex. The diffuser is manufactured, for example, from a glass or from a synthetic resin by which the light is diffusely scattered.

An assembly of known luminaires has the disadvantage that a comparatively wide, comparatively dark band is present between the luminaires in ~~said~~ the assembly of a first luminaire and a second luminaire. This disadvantage is counteracted by ~~means of~~ an assembly of a first luminaire and a second luminaire according to the invention for illuminating an object.

In this case, the first luminaire lies against the second luminaire with respective side walls, while the edge of the light emission window of the first luminaire lies against an edge of a light emission window of the second luminaire in the assembly of the first and the second luminaire, and ~~said~~ the light emission windows and ~~said~~ the side walls are manufactured from a light-transmitting material.

It was found that the light emission windows together form an evenly illuminated surface during operation of the lamp. The expression "evenly illuminated" in the description of the present invention means that the light emission window has a light distribution over the surface of the light emission window during operation which shows differences in intensity which are not or substantially not observable to the human eye. Furthermore, the expression "evenly illuminated" in relation to the assembly means that especially the edges of the respective light emission windows and transitions between mutually adjoining luminaires show differences in light intensity with respect to the light emitted by the relevant light emission window as a whole which are not or substantially not observable. In other words, the light output of a light emission window, including its edge, shows a dependence on the position on the light emission window which is not or substantially not observable. The assembly is built up in such a way that the light emission windows of mutually adjoining luminaires touch one another or at least substantially touch one another, whereby a comparatively wide, comparatively dark band at the area of contact of the mutually adjoining luminaires, as present in the known assembly, is avoided. Since the side wall of the luminaire is manufactured from an optically transparent material, light emitted by the tubular lamps during operation is partly caught by this side wall, ~~said~~ the light thus caught being transported by internal reflections in the direction of the light emission window, where it is emitted again. This achieves that the edge of the light emission window of the first luminaire has a luminous intensity, which is at least substantially equal to that of the rest of the light emission window. In a situation with two or more luminaires adjoining one another in the assembly at the areas of the edges of the light emission windows of the respective luminaires, a light emission window is obtained thereby which is evenly illuminated up to and including the edge of the light emission window during operation, such that the assembly emits a uniform light. An observer will not or substantially not be capable of distinguishing the edges of the light emission windows of the respective luminaires on the basis of the light distribution as emitted by the assembly during operation.

The luminaires usually do not lie against one another in the known assembly of luminaires, so that a comparatively wide, dark band is present and observed between the luminaires. These bands achieve that the known assembly has a checkered appearance and that in addition the object is not evenly illuminated. Since the object is integrally and evenly illuminated thanks to the measure according to the invention, an observer's attention is not diverted from the object by irregularities in the illumination of the object. The use of the assembly according to the invention renders it possible to illuminate objects very homogeneously and uniformly. This has special advantages for viewing, for example, artistic objects in museums or motor vehicles, for example in showrooms of garages. The absence of visible edges in the assembly is perceived to be an advantage in its reflection on the object, especially in the case of objects having reflecting properties, preferably objects having specular reflection. The measure according to the invention enhances the attractiveness of objects presented, for example, with the purpose of selling the objects.

The patent application EP 99203849.7 not previously published describes a luminaire for illuminating an object, wherein the luminaire comprises a housing for accommodating at least one tubular lamp, which housing has a light emission window for illuminating the object and a side wall transverse to the light emission window, while a diffuser is positioned in the light emission window, ~~said~~ the diffuser having a layer thickness variation such that the layer thickness of the diffuser is chosen to be greater opposite a location where the tubular lamp is present during operation than farther removed from the lamp. To achieve that the light emission window forms an acceptable, homogeneously illuminated surface, a large difference in layer thickness is required between the location directly opposite the tubular lamp and a location farther removed from the lamp. Contours of the tubular lamp, however, are visible as small differences in light intensity when viewed at an angle to the optical axis and transverse to the longitudinal direction of the tubular lamp. These contours are more clearly visible from locations where a virtual line between an observer and the tubular lamp intersects the diffuser in a location where the diffuser has a comparatively small layer thickness.